CLAIMS

What is claimed is:

1. A method of optimizing an objective function related to a subterranean well system, comprising:

constructing a reservoir model and a well network model of the well system;

functionally connecting a controller to the reservoir model and the well network model;

running a simulation with at least one of the reservoir model and the well network model and with a set of input variables related to the at least one of the reservoir model and the well network model; and

optimizing an objective function by varying the set of variables.

2. The method of claim 1, wherein the optimizing step comprises optimizing an objective function that relates only to the reservoir model.

3. The method of claim 1, wherein the optimizing step comprises optimizing an objective function that relates only to the well network model.

4. The method of claim 1, wherein the optimizing step comprises optimizing an objective function that relates to both the reservoir model and the well network model.

5. The method of claim 1, wherein the optimizing step comprises optimizing a first objective function that relates to the reservoir model and optimizing a second objective function that relates to the well network model.

6. The method of claim 5, wherein the optimizing of the first and second objective functions occurs simultaneously.

7. The method of claim 6, wherein the optimizing a first objective function step and optimizing a second objective function step each comprises conducting the optimization with one of a discrete optimizer module, a continuous optimizer module, and a mixed-mode optimizer module.

8. The method of claim 7, wherein the optimizing a first objective step and optimizing a second objective function step are conducted using different optimizer modules.

9. The method of claim 1, further comprising constraining the objective function with at least one secondary objective.

10. The method of claim 1, further comprising conducting the optimizing step with a discrete optimizer module.

11. The method of claim 1, further comprising conducting the optimizing step with a continuous optimizer module.

12. The method of claim 1, further comprising conducting the optimizing step with a mixed-mode optimizer module.

13. The method of claim 1, wherein the optimizing step comprises maximizing the production of hydrocarbons from the well system.

14. The method of claim 13, wherein the set of variables comprises the positions of at least one valve located in the well system.

15. The method of claim 1, wherein the well system comprises a single wellbore.

16. The method of claim 1, wherein the well system comprises a plurality of wellbores.

17. The method of claim 1, wherein the well system comprises at least one subsea wellbore.

18. The method of claim 1, wherein the optimizing step comprises varying the set of variables using a directed search component and a random search component.

19. The method of claim 1, wherein the constructing step comprises obtaining data from sensors located in the well system.

20. The method of claim 19, wherein the obtaining step comprises permanently deploying the sensors in the well system.

21. The method of claim 19, wherein the obtaining step comprises temporarily deploying the sensors in the well system.

22. The method of claim 1, wherein the constructing step comprises constructing the reservoir model using at least one of reservoir data, well data, and production data from the well system.

23. The method of claim 1, wherein the constructing step comprises constructing the well network model using at least one of pipeline physical data, fluid property data, and process element performance data from the well system.

24. The method of claim 1, further comprising:

constructing a processing plant model related to the well system;

functionally connecting the controller to the processing plant model;

running a simulation with at least one of the reservoir model, the well network model, and the processing plant model and with a set of variables related to the at least one of the reservoir model, the well network model, and the processing plant model; and

optimizing an objective function by varying the set of variables.

25. The method of claim 24, wherein the optimizing step comprises optimizing an objective function that relates only to the processing plant model.

26. The method of claim 24, wherein the optimizing step comprises optimizing an objective function that relates to at least two of the reservoir model, the well network model, and the processing plant model.

27. The method of claim 24, wherein the optimizing step comprises optimizing an objective function that relates to each of the reservoir model, the well network model, and the processing plant model.

28. The method of claim 1, further comprising storing the controller in a memory of a computer system.

29. The method of claim 28, further comprising storing the reservoir model and well network model in the memory.

30. The method of claim 1, further comprising selecting a type of optimizer module to use for the optimizing step.

31. The method of claim 30, wherein the selecting step is performed by an operator.

32. The method of claim 30, wherein the selecting step is performed automatically by a computer system.

33. A system for optimizing an objective function related to a subterranean well system, comprising:

a storage medium including a reservoir model and a well network model of the well system;

a controller functionally connected to the reservoir model and the well network model;

a processor adapted to run a simulation with at least one of the reservoir model and the well network model and with a set of input variables related to the at least one of the reservoir model and the well network model; and

the controller adapted to optimize an objective function by varying the set of variables.

34. The system of claim 33, wherein the objective function relates only to the reservoir model.

35. The system of claim 33, wherein the objective function relates only to the well network model.

36. The system of claim 33, wherein the objective function relates to both the reservoir model and the well network model.

37. The system of claim 33, wherein the controller optimizes a first objective function that relates to the reservoir model and optimizes a second objective function that relates to the well network model.

38. The system of claim 37, wherein the controller optimizes each of the first and second objective functions with one of a discrete optimizer module, a continuous optimizer module, and a mixed-mode optimizer module.

39. The system of claim 38, wherein the controller optimizes the first and second objective functions with a different optimizer module.

40. The system of claim 37, wherein the controller optimizes the first and second objective functions simultaneously.

41. The system of claim 33, further comprising constraining the objective function with at least one secondary objective.

42. The system of claim 33, wherein the controller optimizes the objective function with a discrete optimizer module.

43. The system of claim 33, wherein the controller optimizes the objective function with a continuous optimizer module.

44. The system of claim 33, wherein the controller optimizes the objective function with a mixed-mode optimizer module.

45. The system of claim 33, wherein the objective function is the maximization of the production of hydrocarbons from the well system.

46. The system of claim 45, wherein the set of variables comprises the positions of at least one valve located in the well system.

47. The system of claim 33, wherein the well system comprises a single wellbore.

48. The system of claim 33, wherein the well system comprises a plurality of wellbores.

49. The system of claim 33, wherein the well system comprises at least one subsea wellbore.

50. The system of claim 33, wherein the controller is adapted to vary the set of variables using a directed search component and a random search component in order to optimize the objective function.

51. The system of claim 33, wherein the reservoir model is constructed using data from sensors located in the well system.

52. The system of claim 51, wherein the sensors are permanently deployed in the well system.

53. The system of claim 51, wherein the sensors are temporarily deployed in the well system.

54. The system of claim 33, wherein the reservoir model is constructed using at least one of reservoir data, well data, and production data from the well system.

55. The system of claim 33, wherein the well network model is constructed using at least one of pipeline physical data, fluid property data, and process element performance data from the well system.

56. The system of claim 33, further comprising:

the storage medium includes a processing plant model related to the well system;

the controller is functionally connected to the processing plant model;

the processor is adapted to run a simulation with at least one of the reservoir model, the well network model, and the processing plant model and with a set of variables related to the at least one of the reservoir model, the well network model, and the processing plant model; and

the controller is adapted to optimize an objective function by varying the set of variables.

57. The system of claim 56, wherein the objective function relates only to the processing plant model.

58. The system of claim 56, wherein the objective function relates to at least two of the reservoir model, the well network model, and the processing plant model.

59. The system of claim 56, wherein the objective function relates to each of the reservoir model, the well network model, and the processing plant model.

60. The system of claim 33, wherein the storage medium is a computer storage medium and the controller is also stored in the computer storage medium.

61. The system of claim 33, wherein an optimizer module is selected to optimize the objective function.

62. The system of claim 61, wherein the optimizer module is selected by an operator of the system.

63. The method of claim 61, wherein the optimizer module is selected by the controller.

64. A method of optimizing an objective function related to a subterranean well system, comprising:

constructing a reservoir model and a well network model of the well system;

functionally connecting a controller to the reservoir model and the well network model;

selecting whether to optimize either or both of the reservoir model and the network model;

choosing at least one objective function to optimize;

running a simulation with a set of input variables related to at least one of the reservoir model and the well network model; and

optimizing the at least one objective function by varying the set of variables.